

## WHAT IS CLAIMED IS:

1. 1. A speed change gear for an automatic transmission, comprising:
  2. 1) an input portion for inputting a rotation from a power source;
  3. 2) an output portion disposed substantially coaxially with the input portion;
  4. 3) three planetary gear sets including a first planetary gear set, a second planetary gear set and a third planetary gear set for providing a plurality of power conductive paths to an area defined between the input portion and the output portion; and
  7. 4) a first clutch, a second clutch, a third clutch, a first brake and a second brake to be selectively connected and disconnected in such a manner that the three planetary gear sets change a rotation from the input portion at a corresponding gear change ratio by selecting one of the plurality of the power conductive paths, thereby outputting the thus changed rotation to the output portion, the first clutch, the second clutch, the third clutch, the first brake and the second brake making a combination of engagement and disengagement, the combination making a selection from at least six forward gears and one reverse gear,
  15. one of the three planetary gear sets being a speed reduction planetary gear set for continuously reducing the inputted rotation and outputting the thus reduced rotation,
  17. one of the remaining two planetary gear sets of the three planetary gear sets being a double sun gear planetary gear set which includes;
    19. two sun gears, a common pinion meshing with the two sun gears in common, one ring gear meshing with the common pinion, and a planetary carrier for carrying the common pinion in such a manner that the common pinion rotates, the planetary carrier being adapted to input and output a rotation from between the two sun gears via a center member connected to a side member,
    24. the other of the remaining two planetary gear sets of the three planetary gear sets being a single pinion planetary gear set which includes;
      26. one sun gear, a pinion meshing with the one sun gear, one ring gear meshing with the pinion, and a planetary carrier for carrying the pinion in such a manner that the pinion rotates,
      29. the speed change gear for the automatic transmission including:

30           i)    a first rotation member including one of the two sun gears of the double sun  
31    gear planetary gear set, and being adapted to be held stationary by the second brake;  
32           ii)    a second rotation member including the other of the two sun gears of the  
33    double sun gear planetary gear set, and receiving via the second clutch the reduced  
34    rotation from the speed reduction planetary gear set;  
35           iii)    a third rotation member including an element connected mutually to the  
36    double sun gear planetary gear set and the single pinion planetary gear set, and outputting  
37    the changed rotation to the output portion;  
38           iv)    a fourth rotation member receiving via the third clutch the inputted rotation,  
39    being adapted to be held stationary by the first brake and including an element in the  
40    double sun gear planetary gear set and the single pinion planetary gear set; and  
41           v)    a fifth rotation member receiving via the first clutch the outputted rotation  
42    from the speed reduction planetary gear set, and including an element in the corresponding  
43    one of the double sun gear planetary gear set and the single pinion planetary gear set,  
44           one of the double sun gear planetary gear set and the single pinion planetary gear set  
45    which relates to the second rotation member and the fifth rotation member being disposed  
46    nearer to the speed reduction planetary gear set than the other of the double sun gear  
47    planetary gear set and the single pinion planetary gear set.

1    2.    The speed change gear for the automatic transmission as claimed in claim 1, wherein  
2       the speed reduction planetary gear set is a single pinion planetary gear set including  
3    a first sun gear which is continuously held stationary, a first ring gear (R1), a first pinion  
4    meshing with the first sun gear and the first ring gear, and a first planetary carrier for  
5    carrying the first pinion in such a manner that the first pinion rotates,  
6       the single pinion planetary gear set of the other of the remaining two planetary gear  
7    sets of the three planetary gear sets includes a second sun gear, a second pinion meshing  
8    with the second sun gear, a second ring gear meshing with the second pinion, and a second  
9    planetary carrier for carrying the second pinion in such a manner that the second pinion  
10   rotates,  
11       the double sun gear planetary gear set includes a third sun gear and a fourth sun gear  
12    which two sun gears constituting a double sun gear, a third pinion meshing with the third  
13    sun gear and the fourth sun gear in common, a third ring gear meshing with the third

14 pinion, and a third planetary carrier for carrying the third pinion in such a manner that the  
15 third pinion rotates, the third planetary carrier being adapted to input and output a rotation  
16 from between the third sun gear and the fourth sun gear via the center member connected  
17 to the side member,

18 disposed sequentially from the input portions' side are the speed reduction planetary  
19 gear set, the single pinion planetary gear set of the other of the remaining two planetary  
20 gear sets of the three planetary gear sets, and the double sun gear planetary gear set,

21 the input portion is connected to the first ring gear and is adapted to be made  
22 connectable to the center member by the third clutch,

23 the second sun gear and the third sun gear are connected mutually by a first  
24 connector member, and are adapted to be made connectable to the first planetary carrier by  
25 the second clutch,

26 the second planetary carrier and the third ring gear are mutually connected by a  
27 second connector member, and are connected to the output portion,

28 the first planetary carrier and the second ring gear are adapted to be connected by the  
29 first clutch,

30 the third planetary carrier is adapted to be held stationary by the first brake, while  
31 the fourth sun gear is adapted to be held stationary by the second brake, and

32 the first clutch and the second clutch are disposed close to the single pinion  
33 planetary gear set of the other of the remaining two planetary gear sets of the three  
34 planetary gear sets.

1 3. The speed change gear for the automatic transmission as claimed in claim 2, wherein  
2 engaging the first clutch and the first brake brings about a first gear,  
3 engaging the first clutch and the second brake brings about a second gear,  
4 engaging the first clutch and the second clutch brings about a third gear,  
5 engaging the first clutch and the third clutch brings about a fourth gear,  
6 engaging the second clutch and the third clutch brings about a fifth gear,  
7 engaging the third clutch and the second brake brings about a sixth gear, and  
8 engaging the second clutch and the first brake brings about the reverse gear.

1 4. The speed change gear for the automatic transmission as claimed in claim 2, wherein

2        the first rotation member includes a brake hub, a rear end wall, and the fourth sun  
3        gear,

4        the second rotation member includes the second sun gear, the third sun gear, the first  
5        connector member, and a clutch hub,

6        the third rotation member includes the second connector member, the second  
7        planetary carrier, the third ring gear, and a tubular connector member, the second  
8        planetary carrier and the third ring gear being connected with each other by the second  
9        connector member,

10       the fourth rotation member includes the third planetary carrier, the center member, a  
11       middle shaft, a clutch drum, an outer member, and a brake hub, and

12       the fifth rotation member includes the second ring gear.

1       5. The speed change gear for the automatic transmission as claimed in claim 1, wherein  
2       the speed reduction planetary gear set is a double pinion planetary gear including a  
3       first sun gear which is continuously held stationary, a first ring gear, a first primary pinion  
4       meshing with the first sun gear, a first secondary pinion meshing with the first ring gear,  
5       and a first planetary carrier for carrying the first primary pinion and the first secondary  
6       pinion in such a manner that the first primary pinion and the first secondary pinion rotate,

7       the single pinion planetary gear set of the other of the remaining two planetary gear  
8       sets of the three planetary gear sets includes a second sun gear, a second pinion meshing  
9       with the second sun gear (S2), a second ring gear (R2) meshing with the second pinion,  
10       and a second planetary carrier for carrying the second pinion in such a manner that the  
11       second pinion rotates,

12       the double sun gear planetary gear set includes a third sun gear and a fourth sun gear  
13       which two sun gears constituting a double sun gear, a third pinion (P3) meshing with the  
14       third sun gear and the fourth sun gear in common, a third ring gear meshing with the third  
15       pinion, and a third planetary carrier for carrying the third pinion in such a manner that the  
16       third pinion rotates, the third planetary carrier being adapted to input and output a rotation  
17       from between the third sun gear and the fourth sun gear via the center member connected  
18       to the side member,

19       disposed sequentially from the input portions' side are the speed reduction planetary  
20    gear set, the single pinion planetary gear set of the other of the remaining two planetary  
21    gear sets of the three planetary gear sets, and the double sun gear planetary gear set,

22       the input portion is connected to the first planetary carrier and is adapted to be made  
23    connectable to the center member by the third clutch,

24       the second sun gear and the third sun gear are connected mutually by a first  
25    connector member, and are adapted to be made connectable to the first ring gear by the  
26    second clutch,

27       the second planetary carrier and the third ring gear are mutually connected by a  
28    second connector member, and are connected to the output portion,

29       the first ring gear and the second ring gear are adapted to be connected by the first  
30    clutch,

31       the third planetary carrier is adapted to be held stationary by the first brake, while  
32    the fourth sun gear is adapted to be held stationary by the second brake, and

33       the first clutch and the second clutch are disposed close to the single pinion  
34    planetary gear set of the other of the remaining two planetary gear sets of the three  
35    planetary gear sets.

1    6. The speed change gear for the automatic transmission as claimed in claim 5, wherein  
2    engaging the first clutch and the first brake brings about a first gear,  
3    engaging the first clutch and the second brake brings about a second gear,  
4    engaging the first clutch and the second clutch brings about a third gear,  
5    engaging the first clutch and the third clutch brings about a fourth gear,  
6    engaging the second clutch and the third clutch brings about a fifth gear,  
7    engaging the third clutch and the second brake brings about a sixth gear, and  
8    engaging the second clutch and the first brake brings about the reverse gear.

1    7. The speed change gear for the automatic transmission as claimed in claim 5, wherein  
2    the first rotation member includes a brake hub, a rear end wall, and the fourth sun  
3    gear,  
4    the second rotation member includes the second sun gear, the third sun gear, the first  
5    connector member, and a clutch hub,

6        the third rotation member includes the second connector member, the second  
7        planetary carrier, the third ring gear, and a tubular connector member, the second  
8        planetary carrier and the third ring gear being connected with each other by the second  
9        connector member,

10        the fourth rotation member includes the third planetary carrier, the center member, a  
11        middle shaft, a clutch drum, an outer member, and a brake hub, and  
12        the fifth rotation member includes the second ring gear.

1        8.        The speed change gear for the automatic transmission as claimed in claim 1, wherein  
2        the speed reduction planetary gear set is a double pinion planetary gear set including  
3        a first sun gear which is continuously held stationary, a first ring gear, a first primary  
4        pinion meshing with the first sun gear, a first secondary pinion meshing with the first ring  
5        gear, and a first planetary carrier for carrying the first primary pinion and the first  
6        secondary pinion in such a manner that the first primary pinion and the first secondary  
7        pinion rotate,

8        the double sun gear planetary gear set includes a second sun gear and a fourth sun  
9        gear which two sun gears constituting a double sun gear, a second pinion meshing with the  
10       second sun gear and the fourth sun gear in common, a second ring gear meshing with the  
11       second pinion, and a second planetary carrier for carrying the second pinion in such a  
12       manner that the second pinion rotates, the second planetary carrier being adapted to input  
13       and output a rotation from between the second sun gear and the fourth sun gear via the  
14       center member connected to the side member,

15        the single pinion planetary gear set of the other of the remaining two planetary gear  
16       sets of the three planetary gear sets includes a third sun gear, a third pinion meshing with  
17       the third sun gear, a third ring gear meshing with the third pinion, and a third planetary  
18       carrier for carrying the third pinion in such a manner that the third pinion rotates,

19        disposed sequentially from the input portions' side are the speed reduction planetary  
20       gear set, the double sun gear planetary gear set, and the single pinion planetary gear set of  
21       the other of the remaining two planetary gear sets of the three planetary gear sets,

22        the input portion is connected to the first planetary carrier and is adapted to be made  
23       connectable to the third planetary carrier by the third clutch,

24        the third planetary carrier is adapted to be held stationary by the first brake,

25        the second sun gear and the third sun gear are connected mutually by a first  
26 connector member, and are adapted to be held stationary by the second brake,

27        the second planetary carrier and the third ring gear are mutually connected by a  
28 second connector member, and the center member extends from the second planetary  
29 carrier radially inward via between the second sun gear and the fourth sun gear to be  
30 connected to the output portion,

31        the first ring gear is adapted to be connected to the second ring gear (R2) by the first  
32 clutch, and is adapted to be connected to the fourth sun gear by the second clutch, and

33        the first clutch and the second clutch are disposed close to the double sun gear  
34 planetary gear set of the one of the remaining two planetary gear sets of the three planetary  
35 gear sets.

1        9.    The speed change gear for the automatic transmission as claimed in claim 8, wherein  
2        engaging the first clutch and the first brake brings about a first gear,  
3        engaging the first clutch and the second brake brings about a second gear,  
4        engaging the first clutch and the second clutch brings about a third gear,  
5        engaging the first clutch and the third clutch brings about a fourth gear,  
6        engaging the second clutch and the third clutch brings about a fifth gear,  
7        engaging the third clutch and the second brake brings about a sixth gear, and  
8        engaging the second clutch and the first brake brings about the reverse gear.

1        10.   The speed change gear for the automatic transmission as claimed in claim 8, wherein  
2        the first rotation member includes the first connector member, the second sun gear,  
3        the third sun gear, and a brake hub,  
4        the second rotation member includes the fourth sun gear and a clutch hub,  
5        the third rotation member includes the second planetary carrier, the third ring gear,  
6        and the second connector member,  
7        the fourth rotation member includes the third planetary carrier, a tubular connector  
8        member, and a brake hub, and  
9        the fifth rotation member includes the second ring gear.

1        11.   The speed change gear for the automatic transmission as claimed in claim 1, wherein

2 at least one of the first clutch and the second clutch is disposed on an outer periphery  
3 of the planetary gear set which is nearer to the speed reduction planetary gear set.

1 12. The speed change gear for the automatic transmission as claimed in claim 11,  
2 wherein

3 the third clutch is disposed on a side same as a side of the first clutch and the second  
4 clutch disposed on the planetary gear set which is nearer to the speed reduction planetary  
5 gear set.

1 13. The speed change gear for the automatic transmission as claimed in claim 1, wherein  
2 the first brake and an element of the planetary gear set are connected by a connector  
3 member which is taken out from a rear side of the planetary gear set, the element  
4 connected to the first brake being adapted to be held stationary by the first brake, the rear  
5 side of the planetary gear set being farthest away from the speed reduction planetary gear  
6 set, and

7 the second brake and an element of the planetary gear set are connected by a  
8 connector member which is taken out from the rear side of the planetary gear set, the  
9 element connected to the second brake being adapted to be held stationary by the second  
10 brake, the rear side of the planetary gear set being farthest away from the speed reduction  
11 planetary gear set.

1 14. The speed change gear for the automatic transmission as claimed in claim 13,  
2 wherein

3 the first brake and the second brake are disposed on an outer periphery of the first  
4 clutch and an outer periphery of the second clutch.